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AEROSOL VALVE

This invention relates to a valve for a pressurized package commonly referred to as an aerosol package.

Aerosol packages usually comprise a valve unit situated in the neck of the container which is opened by finger pressure against an actuator disposed at one terminus of a valve stem. The valve unit has a movable valve body and associated hollow valve stem which unseats from a gasket, thereby permitting flow of product into a hollow valve stem (product conduit).

With certain products, e.g. paints, it is desirable that the valve stem be separable from the valve body in order to clean the product conduit should drying and resultant clogging occur. To provide the aforementioned valve stem removal capability, the valve stem, at one end, is molded integral to the valve actuator to thereby permit its separation from the valve body by pulling on the actuator. At the other end the valve stem mates with a movable valve body situated beneath a resilient gasket, the valve stem being passed through a central opening in the resilient gasket. The gasket seals the product discharge orifice in the valve stem when the valve is in a closed position. By depressing the valve stem, the product orifice in the stem is open to flow of product from the container.

More particularly, the aforescribed aerosol valve comprises a container closure, commonly called a mounting cup, which is clinched to the container bead. Within and crimped to an

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upstanding central portion of the mounting cup, commonly called a pedestal, is a valve housing having a resilient gasket disposed atop thereof, which gasket forms a seal between the valve housing and the mounting cup. Disposed within the housing is reciprocable
5 valve closing/opening member comprising a valve body and valve stem, which body and stem have communicating passages for egress of the pressurized product to a discharge orifice situated in a finger depressible actuator.

The aerosol valve described above is commonly referred to in
10 the aerosol industry as a "female" valve, in contrast to the so called "male" valve wherein the valve stem is molded integral to the valve body. United States Patent Nos. 3,033,473, 3,061,203, 3,074,601 and 3,209,960 describe aerosol valves of the "female" type and United States Patent 2,631,814 and aerosol valve of the
15 "male" type.

Furthermore, in prior aerosol valves, the product orifice in the valve stem is formed by a radial pin extending laterally through the wall of the valve stem, a so-called "side action" molding operation. The presence of the "side action" pin
20 necessitates the removal of the pin before ejection of the molded part, with a consequent time delay in the molding operation. Moreover, with orifice sizes commonly used in aerosol valves, the "side action" pin often breaks with consequent shutdown of the molding operation.

25 Additionally, in prior aerosol valves, the central opening of the gasket seals radially against the product orifice in the



valve stem. This sealing of the valve stem orifice upon closure of the valve forecloses gravitational return of the product in the hollow valve stem from moving past the valve stem orifice with the often consequent result that residual product in the hollow valve stem dries and clogs the passage in the valve stem.

According to the present invention there is provided an aerosol valve unit comprising a mounting cup having a central aperture therein, a valve assembly positioned within said cup and comprising a valve housing, a valve body moveably mounted within said housing, a valve spring upwardly biasing the valve body within the valve housing against the underside of the mounting cup, a hollow valve stem extending upwardly from the valve body through the central aperture, said valve stem being actuable by downward pressure thereon to move the valve body against said spring bias away from the underside of the mounting cup, an annular gasket positioned about the valve stem and sealingly engaged between the valve body and the underside of the mounting cup, and fluid flow passageway in the valve body permitting pressurized product to flow from the valve housing to the hollow bore of the valve stem, when said stem is depressed, wherein said fluid flow passageway in the valve body comprises a slot extending through an annular wall upstanding from the valve body towards and into the annular gasket, that slot being sealed by said gasket when the valve is in the closed position.

More specifically, and as preferred embodiment, the aerosol valve of this invention includes a recess in the valve body beneath the valve stem orifice.

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Referring to the drawings:

Figure 1 is a longitudinal sectional view of the valve of this invention in closed position.

5 Figure 2 is a longitudinal section of the valve of this invention in open position.

Figure 3 is an enlarged longitudinal section of the valve stem of Figures 1 and 2.

Figure 4 is a bottom plan view of Figure 3.

10 Figure 5 is an enlarged longitudinal partial section of the valve body of Figures 1 and 2.

Figure 6 is a top plan view of Figure 5.

Figure 7 is an enlarged longitudinal partial section of the valve stem and valve body of Figure 1.

15 Figure 8 is a perspective view of the valve body of Figures 1, 2, 5-7.

Referring to the drawings, the mounting cup is generally designated as 10. Crimped to the mounting cup 10 is a valve housing 12 and a gasket 14. Disposed within the housing 12 is
20 the valve body 16 having a recess 22, which valve body is biased toward the gasket 14 by the spring 18. A conventional dip tube 46 is shown attached to the bottom of the housing 12. A valve stem, generally designated as 20, is disposed within the recess 22 (shown in greater detail in Figure 5) in the top of the valve
25 body 16 through the friction fitment of the depending extension 24 of the valve stem 20. Upstanding arcuate walls 26 (shown in

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detail in Figure 8) form the upper portion of the recess 22 and define a slot 21. Beneath the slot 21, defined by the upstanding arcuate walls 26, are grooves 32 in the side wall of the valve body recess 22, which grooves 32 communicate with the space or reservoir 34 situated in the valve body recess 22 beneath the valve stem 20. An annular recess 50 is disposed in the top shoulder 40 of the valve body 16.

The valve stem 20 has an orifice 42 communicating with the space 34, which orifice in the preferred embodiment of the invention acts as a product flow control orifice. A recess 30 is formed in the base of the valve stem 20 having a shoulder 28 against which the arcuate walls 26 bottom when the valve body 16 and valve stem 20 are in assembled relation. The outer wall 48 of the recess 30 in the valve stem 20 is tapered.

15 Actuator button 36 is mounted on the upper portion of the valve stem 20. An annular rib or barb 38 is formed on the valve stem 20, which rib 38 anchors the valve stem 20 to the actuator button 36 and facilitates removal of the valve stem 20 from the valve body 16.

20 In the closed position of the aerosol valve, shown in Figure 1, the gasket 14 seals against the annular top shoulder 40 of the valve body 16 and the upstanding arcuate walls 26 of the valve body 16 to prevent passage of product through the slot 21.

- In the open position of the valve, shown in Figure 2,
25 pressure on the actuator button 36 depresses the valve stem 20 and the valve body 16 to expose the slot 21 to the pressurized

contents of the container, thereby permitting passage of the container contents through the slot 21, the grooves 32, the space 34, the orifice 42 to the discharge orifice 44.

5 The product passages formed in the valve stem and valve body of the subject invention require no "side action" molding pins. Further disposing the orifice 42 on the discharge side of the space 34 serves the function of permitting product in the valve stem on the discharge side of orifice 42 to back flow into the space 34 and thus not dry and clog the product passage in the
10 valve stem. Still further, disposing the orifice 42 on the discharge side of the space 34 creates a residue of propellant in space 34 upon closing of the aerosol valve, which residue will assist in purging the valve stem and actuator product passages of residual product to thereby avoid or reduce clogging.

15 In assembling the several valve components, a sub-assembly comprising the valve stem, valve body, spring and gasket is initially made. Such a sub-assembly properly orients and maintains the position of the gasket relative to the valve body, thereby enabling rapid assembly of the sub-assembly and other
20 valve components without risk of dislodging the orientation of the gasket to the other components prior to permanent positioning of the gasket through crimping of the valve to the mounting cup.

The structure in the valve stem-valve body fitment portions that facilitates disposition and positional stabilization of the
25 gasket onto the valve body is best shown in Figure 7. In assembling the valve unit the gasket 14 is passed over the outside

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surface of valve stem 20 and ultimately seated on the shoulder 40 of the valve body 16. Movement of the gasket 14 to a seating atop shoulder 40 of arcuate walls 26 is facilitated by the sloped shoulder 48 the valve stem 20.

5 Moreover, the height of the upstanding arcuate walls 26 is preferably greater than the gasket thickness, so as to avoid the top shoulder of the arcuate walls 26 passing beneath the gasket 14 during pressure filling of the container with propellant body.

The structure designation numbers used herein in the
10 description of Figures 1 and 2 likewise designate the same structural components in Figures 3-8.



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CLAIMS

1. An aerosol valve unit comprising a mounting cup having a central aperture therein, a valve assembly positioned within said cup and comprising a valve housing, a valve body movably mounted within said housing, a valve spring upwardly biasing the valve body within the valve housing against the underside of the mounting cup, a hollow valve stem extending upwardly from the valve body through the central aperture, said valve stem being actuable by downward pressure thereon to move the valve body against said spring bias away from the underside of the mounting cup, an annular gasket positioned about the valve stem and sealingly engaging between the valve body and the underside of the mounting cup, and fluid flow passageway in the valve body permitting pressurized product to flow from the valve housing to the hollow bore of the valve stem, when said stem is depressed, wherein said fluid flow passageway in the valve body comprises a slot extending through an annular wall upstanding from the valve body, towards and into the annular gasket, that slot being sealed by said gasket when the valve is in the closed condition.
2. A valve unit according to claim 1, wherein the slot extends downwardly from the upper rim of said annular wall.
3. A valve unit according to claim 1 or 2, wherein the valve body presents an outwardly directed annular shoulder adjacent the base of said annular upstanding wall which serves as an additional sealing surface when the valve is in the closed condition by virtue of the annular gasket engaging against said shoulder.
4. A valve unit according to claim 1, 2 or 3, wherein the valve stem is a frictional fit within the valve body.
5. A valve unit according to any one of claims 1-4, wherein the valve body defines an internal recess or chamber into which fits the proximal end of the valve stem, and wherein the wall of the recess or chamber is formed with one or more longitudinally extending grooves which communicate with said slot to provide, when the valve is opened, a passageway for the flow of pressurized product from said slot into the bore of the valve stem.

6. A valve unit according to claim 5, wherein said internal recess or chamber extends from the proximal end of the valve stem to stem to define a reservoir space within the valve body, the bore of valve stem and said groove(s) being in open communication with said reservoir space for the discharge and inflow, respectively, of said pressurized product, when the valve is open.

7. A valve unit according to claim 6, wherein said bore of the valve stem opens axially into said reservoir space through a metering aperture in the end face of the valve stem.

8. A valve unit according to any one of claims 1-7, wherein the upstanding annular wall on the valve body presents two diametrically opposed slots separated one from the other by arcuate sections of said upstanding annular wall.

9. A valve unit according to any one of claims 1-8, wherein the valve stem has a downwardly open annular recess which mates with the upstanding annular wall on the valve body.

10. A valve unit according to claim 9, wherein the outer surface of the valve stem is inwardly chamfered in the region of said annular recess.

11. A valve unit according to claim 1, substantially as hereinbefore described with reference to the accompanying drawings.

